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IMPACT OF THE KATRINA AND RITA ON OJ GALLON SALES

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The impacts of Katrina and Rita on OJ gallon sales

Katrina: made landfall on August 29, 2005, a category 4 hurricane, pounded the Gulf Coast with devastating force at daybreak. Rita made landfall on September 24, 2005, a category 3 hurricane, with an eye 20 miles wide and wind gusts of almost 150 miles per hour, slammed into the Gulf Coast before dawn.

USA Today (09-29-05) estimated Katrina dispersed 1.3 million Gulf Coast households. About three-fourth (975,000) of the households went to Baton Rouge and other communities within 250 miles of New Orleans; roughly 240,000 went to Houston, San Antonio, Dallas, Atlanta and other cities within about 500 miles of the battered coast; About 26,000 went to cities such as Chicago, Detroit and Baltimore, 750 to 1000 miles away; and at least 34,000 moved more than 1000 miles to cities such as Seattle and Boston. Before Rita made the landfall, about 2 million people evacuated from the Houston/Galveston area for a day or two. Note that most households evacuated after Katrina made the landfall remained in the New Orleans/Mobile market areas. CNN (10-10-05) reported about 400,000 people lost their jobs due to Katrina and Rita.

The dislocation of millions of households in the Gulf Coast areas had disrupted the daily routines of these households and may have undesirable impacts on OJ consumption. The purpose of this analysis is to quantify the impacts of these two hurricanes on the demand for OJ in markets around the Gulf Coast areas.

An econometric model was used to estimate the impact of hurricanes on OJ purchases. It is assumed that OJ purchases are influenced by the price of OJ and the prices of close substitutes of OJ, a time trend, seasonality, and the impacts of Katrina and Rita. Formally the model can be written as

$$y_{it} = \alpha_i + \Sigma_j \beta_{ij} p_{jt} + \gamma_i Tr_t + \Sigma_k \varphi_k D_{ik} + \varepsilon_{it};$$

where i denotes market, t denotes week, y is the weekly OJ sales in gallons, p is the average price per gallon, Tr is trend variable that has values of 1 through 119, D is a set of 17 dummy variables that represents the 17 weeks after Katrina made landfall, ε is the disturbance term, and α, β, γ, and φ are parameters to be estimated. Fifty-second differences were used to remove the seasonality in the data series, the resulting model to be estimated is

$$y_{it} - y_{it-52} = \Sigma_j \beta_{ij} (p_{jt} - p_{it-52}) + \gamma_i (Tr_t - Tr_{it-52}) + \Sigma_k \varphi_k D_{ik} + \varepsilon_{it} - \varepsilon_{it-52};$$

Eight Southern U.S. markets (Tampa, Atlanta, Houston, Dallas, New Orleans/Mobile, Jacksonville, Orlando, and Miami) were included in the study. Because the two hurricanes affected all the eight markets around the same time, seemingly unrelated regression was used to estimate the demand parameters. Results are shown in Table 1 and price elasticity estimates in these eight markets are presented in Table 2.

The results shown in Tables 1 and 2 indicate that all eight own-price elasticity estimates for OJ have the expected negative sign and ranged from -.90 (Miami) to -1.47 (Atlanta). OJ is a substitute for GJ, i.e., when GJ price increases the demand for OJ increases. The cross-price parameter estimates for GJ are positive and significantly different from zero in the Atlanta, Dallas, Houston, and New Orleans/Mobile markets. The cross-price relationship between OJ drinks and OJ are mixed – the cross-price parameter estimates for OJ drinks are positive and significantly different from zero in Houston and Orlando – showing a substitution relationship; but negative in Tampa, Dallas, and Miami, showing a complementary relationship.

The parameter estimates for the 17 dummy variables indicate that the two hurricanes had almost no impact on the demand for OJ in all eight markets studied except the New Orleans/Mobile market. The estimates for the New Orleans/Mobile market show that the demand for OJ in this market decreased during the weeks after the two hurricanes made landfall. The estimated results show that Katrina had the most impact on the demand for OJ the week after it made landfall on the Gulf Coast. Results also show that the estimated loss in OJ gallon sales increased during the week after Rita made the landfall in Texas. The decrease in OJ gallon sales declined over time, and after eight weeks (week ending 10-22-05), or a month after Rita made landfall, the impact became statistically insignificant. Table 3 shows that the decreases in OJ gallon sales in the New Orleans/Mobile market ranged from 11% to over 30% of the OJ sold in this market. The total OJ gallon lost after the two hurricanes was 200,740 gallons (sum of the estimated impacts for the eight weeks ending 09-03-05 through 10-08-05.

Results presented in Table 1 also show that OJ gallon sales in the Houston market increased (accounted for about 7% of the OJ gallon sales in this market) during the five weeks ending 11-05-05 through 11-19-05, 12-17-05, and 12-24-05. The increased OJ gallon sales during the three weeks in November may have something to do with the two hurricanes, because thousands of households were evacuated to Houston at the end of September.

Similar method was used to analysis the Wal-Mart regional data. Results show that the impacts were insignificant; therefore, no results are presented for Wal-Mart.

Table 1. Demand parameter estimates

	Tampa	Atlanta	Dallas	Houston	Jax	NO/Mob	Orlando	Miami
OJ Pr	-53,353*	-86,203*	-47,484*	-82,481*	-21,328*	-32,382*	-35,020*	-64,834*
	(6,179)	(7,158)	(8,203)	(6,207)	(2,020)	(4,526)	(3,992)	(8,588)
GJ Pr	1,845	19,529*	12,779*	24,458*	302	11,514*	277	-3,144
	(2,738)	(3,468)	(3,816)	(3,238)	(1,718)	(3,763)	(3,100)	(5,301)
OJ BL Pr	-1,572	377	-10,055	-2,228	592	2,950	-591	-230
	(2,609)	(2,550)	(7,028)	(10,049)	(1,241)	(2,444)	(1,799)	(3,726)
OJ DK Pr	-8,121*	1,255	-10,645*	11,771*	262	3,462	16,535*	-20,596*
	(3,527)	(7,339)	(5,056)	(5,835)	(4,311)	(6,930)	(4,138)	(7,556)
Trend	-48	-211*	-215*	-312*	-24	-208*	-57	118
	(46)	(67)	(76)	(66)	(35)	(75)	(58)	(103)
Dummy Variables for Katrina effect								
09/03/05	-9,430	-4,137	1,363	10,078	-6,124	-32,806*	-20,587*	-16,745
	(11,006)	(13,020)	(8,297)	(7,688)	(5,057)	(7,846)	(8,781)	(15,779)
09/10/05	-7,539	-13,289	-272	12,678	1,436	-39,321*	24,175*	33,928*
	(11,101)	(12,748)	(8,610)	(8,274)	(5,073)	(7,794)	(8,761)	(15,969)
09/17/05	-11,061	-7,080	-4,894	4,955	-9,513*	-35,777*	-28,825*	-30,423*
	(11,528)	(12,963)	(9,099)	(7,982)	(5,192)	(8,216)	(9,449)	(17,163)
09/24/05	10,125	17,491	7,161	19,730*	156	-12,207*	-2,372	9,420
	(11,220)	(12,752)	(8,502)	(8,016)	(5,226)	(7,999)	(9,070)	(16,183)
10/01/05	13,518	3,222	4,704	12,545	-1,390	-25,081*	1,980	-1,368
	(11,046)	(12,745)	(9,511)	(7,904)	(5,326)	(7,706)	(9,021)	(16,269)
10/08/05	-10,293	-6,020	-6,436	14,484*	-7,147	-21,880*	-22,368*	-19,425
	(11,061)	(12,733)	(8,784)	(7,896)	(5,425)	(8,163)	(9,184)	(16020)
10/15/05	3,176	-9,843	-10,299	4,693	-2,531	-18,287*	-15,162	-21,116
	(11,195)	(12,706)	(9,199)	(7,992)	(5,399)	(7,937)	(9,095)	(16,717)
10/22/05	24,542*	8,736	-14	11,726	-3,538	-15,382*	-527	14,577
	(11,296)	(12,797)	(8,464)	(8,240)	(5,232)	(7,648)	(8,888)	(16,235)
10/29/05	8,058	4,783	5,397	7,750	2,654	-10,608	1,063	-93,929*
	(11,284)	(13,261)	(9,199)	(7,949)	(5,540)	(8,007)	(9,262)	(16,947)
11/05/05	18,779*	-4,691	9,090	15,020*	323	-5,451	-729	4,590
	(11,174)	(12,896)	(8,971)	(7,873)	(5,080)	(8,134)	(8,979)	(16,395)
11/12/05	33,897*	10,757	101	14,329*	175	4,605	3,498	24,340
	(11,248)	(12,985)	(8,780)	(8,426)	(5,079)	(8,278)	(9,129)	(15,987)
11/19/05	11,412	15,559	15,940*	15,214*	313	2,589	2,950	-5,044
	(11,153)	(13,144)	(9,096)	(8,509)	(5,259)	(7,360)	(9,177)	(16,257)
11/26/05	21,796	1,556	4,701	7,445	-1,915	10,575	-1404	-8,756
	(11,333)	(14,513)	(8,967)	(7,975)	(5,255)	(8,005)	(9,603)	(16,876)
12/03/05	18,061	-479	5,300	9,013	1,072	5,189	-407	-5,283
	(11,081)	(13,535)	(10,228)	(8,247)	(5,202)	(8,274)	(9,403)	(16,802)
12/10/05	17,988	4,072	19,841*	8,757	-2,606	-10,975	713	20,608
	(11,200)	(13,330)	(9,238)	(7,918)	(5,373)	(7,809)	(9,276)	(16,391)
12/17/05	11,805	7,577	18,406*	17,857*	-3,639	-5,202	-7,679	13,342
	(11,154)	(13,192)	(10,011)	(8,902)	(5,124)	(7,802)	(9,319)	(16,527)
12/24/05	11,227	8,281	9,394	15,883*	-4,023	-8,634	-5,102	6,528
	(11,473)	(13,079)	(9,991)	(8,414)	(5,192)	(7,839)	(9,370)	(16,883)

Numbers in parentheses are standard errors.

*statistically different from zero at $\alpha = 0.10$ level.

Table 2. Price elasticity estimates

	Tampa	Atlanta	Dallas	Houston	Jax	NO/Mob	Orlando	Miami
OJ	-1.0710	-1.4672	-1.0334	-1.6458	-1.1663	-1.1361	-1.0913	-0.8962
GJ	0.0423	0.4229	0.3251	0.5702	0.0199	0.5016	0.0103	-0.0507
OJ BL	-0.0378	0.0081	-0.2428	-0.0482	0.0395	0.1256	-0.0227	-0.0037
OJ DK	-0.0923	0.0146	-0.1330	0.1237	0.0078	0.0605	0.2958	-0.1623

Table 3. Estimated impact of Katrina and Rita on the demand for OJ in New Orleans/Mobile Market

Date	Gal Sales YAG	Estimated Loss	% loss
09/04/04	130,826	-32,806	-25.1%
09/11/04	128,866	-39,321	-30.5%
09/18/04	128,854	-35,777	-27.8%
09/25/04	120,656	-12,207	-10.1%
10/02/04	121,977	-25,081	-20.6%
10/09/04	127,781	-21,880	-17.1%
10/16/04	130,243	-18,287	-14.0%
10/23/04	135,213	-15,382	-11.4%
10/30/04	132,233	-10,608	-8.0%
11/06/04	128,718	-5,451	-4.2%
11/13/04	136,446	4,605	3.4%
11/20/04	124,573	2,589	2.1%
11/27/04	130,072	10,575	8.1%
12/04/04	124,789	5,189	4.2%
12/11/04	139,287	-10,975	-7.9%
12/18/04	132,176	-5,202	-3.9%
12/25/04	139,494	-8,634	-6.2%